

CLAIMS

1. A current drive circuit for supplying a drive current to a driven object, including:

<sup>SCAN</sup>  
a control line,

<sup>data</sup>  
a signal line to which a signal current having a current level in accordance with information is supplied,

a receiving part for fetching the signal current from the signal line when the control line is selected,

a converting part for converting a current level of the fetched signal current to a voltage level and holding the same, and

a drive part for converting the held voltage signal to a current signal and outputting the drive current.

2. A drive current circuit as set forth in claim 1, wherein the converting part includes a conversion use transistor provided with a control terminal, a first terminal, and a second terminal and a capacitor connected to the control terminal.

3. A current drive circuit as set forth in claim 2, wherein

the converting part includes a switch use transistor inserted between the first terminal and

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control terminal of the conversion use transistor;

the switch use transistor becomes conductive when converting the current level of the signal current to the voltage level and electrically connects the first terminal and the control terminal of the conversion use transistor to create the voltage level with reference to the second terminal at the gate; and

the switch use transistor is cut off when the capacitor holds the voltage level and separates the control terminal of the conversion use transistor and the capacitor connected to this from the first terminal.

4. A current drive circuit as set forth in claim 1, wherein

the receiving part includes a fetch use insulating gate type field effect transistor having a control terminal, a first terminal, and a second terminal, the first terminal connected to a first terminal of the conversion use transistor, the second terminal connected to the signal line, and the control terminal connected to the control line and

the converting part includes a switch use transistor inserted between the first terminal and control terminal of the conversion use transistor.

5. A current drive circuit as set forth in claim 4, wherein the control terminal of the fetch use

transistor and the control terminal of the switch use transistor are connected to different control lines.

6. A current drive circuit as set forth in claim 4, wherein a conductivity type of the conversion use transistor and a conductivity type of the fetch use transistor are different.

7. A current drive circuit as set forth in claim 2, wherein

the drive part includes a drive use transistor provided with a control terminal, a first terminal, and a second terminal and

the drive use transistor receives a voltage level held at the capacitor at its control terminal and passes a drive current having a current level in accordance with the same.

8. A current drive circuit as set forth in claim 7, wherein the control terminal of the conversion use transistor and the control terminal of the drive use transistor are directly connected to configure a current mirror circuit and the current level of the signal current and the current level of the drive current become proportional.

9. A current drive circuit as set forth in claim 7, wherein the drive use transistor is formed in the vicinity of the conversion use transistor and has a equal

threshold voltage as the conversion use transistor.

10. A current drive circuit as set forth in claim 7, wherein the size of the conversion use transistor is set larger than the size of the drive use transistor.

5 11. A current drive circuit as set forth in claim 9, wherein the drive use transistor operates in the saturated region and passes a drive current corresponding to the difference between the voltage level applied to the gate and the threshold voltage.

10 12. A current drive circuit as set forth in claim 9, wherein the drive use transistor operates in the linear region.

15 13. A current drive circuit as set forth in claim 10, wherein the drive use transistor operates in the linear region.

14. A current drive circuit as set forth in claim 2, wherein

the drive part shares the conversion use transistor together with the converting part in a time division manner and

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the drive part separates the conversion use transistor from the receiving part and uses the same for driving after the conversion of the signal current is completed and passes the drive current in a state where

25 the held voltage level is applied to the gate of the

conversion use transistor.

15. A current drive circuit as set forth in claim 14, wherein the drive part has a controlling means for cutting off an unnecessary current via the conversion use transistor at times other than the time of drive.

16. A current drive circuit as set forth in claim 15, wherein

the controlling means comprises a control use transistor provided with a control terminal, a first terminal, and a second terminal, the first terminal connected to the conversion use transistor, and the second terminal connected to the driven object and the said control use transistor becomes nonconductive and separates the conversion use transistor and the driven object in state when the driven object is not driven and switches to the conductive state when the driven object is driven.

17. A current drive circuit as set forth in claim 14, wherein the drive part has a potential fixing means for fixing the potential of a drain with reference to a source of the conversion use transistor so as to stabilize the current level of the drive current flowing through the conversion use transistor.

18. A current drive circuit as set forth in claim 1, wherein

5 transistor at times other than the time of drive.

15, wherein

10 terminal, and a second terminal, the first terminal  
connected to the conversion use transistor, and the  
second terminal connected to the driven object and

15 and the driven object in state when the driven object is  
not driven and switches to the conductive state when the  
driven object is driven.

20 for fixing the potential of a drain with reference to a  
source of the conversion use transistor so as to  
stabilize the current level of the drive current flowing  
through the conversion use transistor.

25 1, wherein

the receiving part, converting part, and drive part configures a current circuit comprised of a plurality of transistors and

at least one transistor has a double-gate structure for suppressing current leakage in the current circuit.

19. A current drive circuit as set forth in claim 1, wherein a leak element is connected between said data line and a predetermined potential.

20. A current drive circuit as set forth in claim 1, wherein an initial value setting element for setting the data to an initial value is connected between said data line and a predetermined potential.

21. A current drive circuit as set forth in claim 7, wherein said drive use insulating gate type field effect transistor is a P-channel type.

22. A current drive circuit for supplying a drive current to a driven object, including:

at least one control line,  
a signal line to which a signal current having a current level in accordance with information is supplied,

a conversion use insulating gate type field effect transistor with a source connected to a reference potential,

5 a fetch use insulating gate type field effect transistor connected between a drain of said conversion use insulating gate type field effect transistor and said signal line and having a gate connected to a said control line,

a drive use insulating gate type field effect transistor connected between the reference potential and said driven object,

10 a capacitor having a first electrode connected in common to a gate of said conversion use insulating gate type field effect transistor and a gate of said drive use insulating gate type field effect transistor and having a second electrode connected to the reference potential, and

15 a switch use insulating gate type field effect transistor connected between a gate and drain of said conversion use insulating gate type field effect transistor and having a gate connected to said control line.

20 23. A current drive circuit for supplying a drive current to a driven object, including:

at least one control line,

25 a signal line to which a signal current having a current level in accordance with information is supplied,

a conversion use insulating gate type field effect transistor with a source connected to a reference potential,

5 a fetch use insulating gate type field effect transistor connected between a drain of said conversion use insulating gate type field effect transistor and said signal line and having a gate connected to said control line,

10 a drive use insulating gate type field effect transistor connected between the reference potential and said driven object,

15 a capacitor having a first electrode connected to a gate of said drive use insulating gate type field effect transistor and having a second electrode connected to a reference potential, and

20 a switch use insulating gate type field effect transistor connected between a gate of said conversion use insulating gate type field effect transistor and a connecting point of a gate of said drive use insulating gate type field effect transistor and a first electrode of said capacitor and having a gate connected to said control line.

24. A current drive circuit as set forth in claim 23, wherein a control terminal of said fetch use  
25 insulating gate type field effect transistor and a



control terminal of said switch use insulating gate type field effect transistor are connected to different control lines.

25. A current drive circuit as set forth in claim 5 23, wherein a size of said conversion use transistor is set larger than a size of said drive use transistor.

26. A display device, comprising:  
a scanning line,  
a data line to which a signal in accordance  
10 with brightness information is supplied, and  
a pixel comprising a display element formed at an intersecting portion of said data line and said scanning line,  
said pixel comprising  
15 a receiving part for fetching the signal supplied to the data line when the scanning line is selected,  
a converting and holding part for converting and holding the fetched signal, and  
20 a drive part for converting the held signal and supplying it to said display element.

27. A display device as set forth in claim 26, wherein said fetched signal is a current, the signal held at said converting and holding part is a voltage, and the  
25 signal supplied to said display element is a current.

28. A display device as set forth in claim 26,  
wherein said converting and holding part comprises a  
first transistor provided with a control terminal and a  
capacitor connected to said control terminal.

5 29. A display device as set forth in claim 28,  
wherein said converting and holding part comprises a  
second transistor connected between the first terminal of  
said first transistor and said control terminal.

30. A display device as set forth in claim 29,  
10 wherein said second transistor becomes conductive in  
state when said signal supplied to the data line is  
fetched by said receiving part and becomes nonconductive  
in state after the signal is supplied to said converting  
and holding part.

15 31. A display device as set forth in claim 29,  
wherein

said receiving part comprises a third  
transistor having a first terminal connected to the first  
terminal of the first transistor and a second terminal  
20 connected to said data line and

the control terminal of said second transistor  
and the control terminal of said third transistor are  
connected to different scanning lines.

32. A display device as set forth in claim 26,  
25 wherein said converting and holding part and said drive

part are the same transistor.

33. A display device as set forth in claim 28,  
wherein said drive part comprises a third transistor  
having a control terminal connected to the control  
5 terminal of said first transistor.

34. A display device as set forth in claim 29,  
wherein said drive part comprises a third transistor  
having a control terminal connected to the control  
terminal of said first transistor and wherein said first,  
10 second, and third transistors configure a current mirror  
circuit.

35. A display device as set forth in claim 28,  
wherein said drive part is said first transistor.

36. A display device as set forth in claim 35,  
15 further comprising a fourth transistor between said first  
transistor and said display element.

37. A display device as set forth in claim 35,  
wherein said display element is connected to the first  
terminal of said first transistor and further comprising  
20 a fourth transistor connected to the second terminal of  
the first transistor.

38. A display device as set forth in claim 26,  
wherein said drive part and said converting and holding  
part are configured by a plurality of transistors.

25 39. A display device as set forth in claim 26,

wherein said converting and holding part comprises a plurality of transistors provided with control terminals and a plurality of capacitors connected to the control terminals.

5        40. A display device as set forth in claim 33, wherein said display element is connected to the first terminal of said third transistor and a constant voltage source is connected to the second terminal of said third transistor.

10       41. A display device as set forth in claim 34, wherein the control terminal of said second transistor is connected to said capacitor.

15       42. A display device as set forth in claim 37, wherein the other end of the capacitor is connected to the second terminal of said first transistor.

43. A display device as set forth in claim 26, wherein said display element has at least one transparent electrode and has a layer including an organic substance sandwiched between said electrodes.

20       44. A display device as set forth in claim 26, wherein a leak element is connected between said data line and a predetermined potential.

45. A display device as set forth in claim 26, wherein an initial value setting element for setting said data to an initial value before said scanning line is

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selected is connected between said data line and a predetermined potential.

46. A display device comprising:

a scanning line,

5 a data line to which a current signal in accordance with brightness information is supplied, and a pixel comprising an organic layer formed at an intersecting portion of said data line and said scanning line,

10 said pixel comprising

a receiving part for fetching the current signal supplied to the data line when the scanning line is selected,

15 a converting and holding part for converting the fetched current signal to a voltage and holding the same, and

a drive part for converting the held voltage signal and supplying a current to said display element.

20 47. A display device as set forth in claim 46, wherein said brightness information is a voltage and wherein the voltage is converted to a current and supplied to the data line.

25 48. A display device as set forth in claim 46, wherein said converting and holding part comprises a

first transistor provided with a control terminal and a capacitor connected to said control terminal.

49. A display device as set forth in claim 48, wherein said converting and holding part comprises a second transistor connected between the first terminal of said first transistor and said control terminal.

50. A display device as set forth in claim 49, wherein said second transistor becomes conductive in state when said signal supplied to the data line is fetched by said receiving part and becomes nonconductive in state after the signal is supplied to said converting and holding part.

51. A display device as set forth in claim 49, wherein said receiving part comprises a third transistor having a first terminal connected to the first terminal of said first transistor and a second terminal connected to said data line and

the control terminal of said second transistor and the control terminal of said third transistor are connected to different scanning lines.

52. A display device as set forth in claim 46, wherein said converting and holding part and said drive part are the same transistor.

53. A display device as set forth in claim 48,

wherein said drive part comprises a third transistor having a control terminal connected to the control terminal of said first transistor.

54. A display device as set forth in claim 49,  
5 wherein said drive part comprises a third transistor having a control terminal connected to the control terminal of said first transistor and wherein said first, second, and third transistors configure a current mirror circuit.

10 55. A display device as set forth in claim 48, wherein said drive part is said first transistor.

56. A display device as set forth in claim 55, further comprising a fourth transistor between said first transistor and said display element.

15 57. A display device as set forth in claim 55, wherein a display element is connected to the first terminal of said first transistor and further comprising a fourth transistor connected to the second terminal of the first transistor.

20 58. A display device as set forth in claim 46, wherein said drive part and said converting and holding part are configured by a plurality of transistors.

59. A display device as set forth in claim 46, wherein said converting and holding part comprises a  
25 plurality of transistors provided with control terminals

and a plurality of capacitors connected to the control terminals.

60. A display device as set forth in claim 61, wherein said display element is connected to the first terminal of said third transistor and a constant voltage source is connected to the second terminal of said third transistor.

61. A display device as set forth in claim 54, wherein the control terminal of said second transistor is connected to said capacitor.

62. A display device as set forth in claim 57, wherein the other end of the capacitor is connected to the second terminal of said first transistor.

63. A display device as set forth in claim 46, wherein said display element has at least one transparent electrode and has a layer including an organic substance sandwiched between said electrodes.

64. A display device as set forth in claim 46, wherein a leak element is connected between said data line and a predetermined potential.

65. A display device as set forth in claim 46, wherein an initial value setting element for setting said data to an initial value before said scanning line is selected is connected between said data line and a predetermined potential.



66. A display device comprising  
a scanning line drive circuit for successively  
selecting scanning lines,  
a data line drive circuit including a current  
5 source for generating a signal current having a current  
level in accordance with brightness information and  
successively supplying the same to data lines, and  
a plurality of pixels arranged at intersecting  
portions of the scanning lines and the data lines and  
10 including current driven type light emitting elements  
emitting light by receiving the supply of the drive  
current, wherein  
each pixel comprises  
a receiving part for fetching the signal  
15 current from a data line when the scanning line is  
selected,  
a converting part for converting a current  
level of the fetched signal current to a voltage level  
and holding the same, and  
20 a drive part for passing a drive current  
having a current level in accordance with the held  
voltage level through the light emitting element.

67. A display device as set forth in claim 66,  
wherein the converting part includes a conversion use  
25 insulating gate type field effect transistor provided

with a gate, a source, a drain, and a channel and a capacitor connected to the gate.

68. A display device as set forth in claim 67, wherein

5 the converting part includes a switch use insulating gate type field effect transistor inserted between the drain and the gate of the conversion use insulating gate type field effect transistor,

10 the switch use insulating gate type field effect transistor becomes conductive when converting the current level of the signal current to the voltage level and electrically connects the drain and the gate of the conversion use insulating gate type field effect transistor to create the voltage level with the source as  
15 the reference at the gate, and

the switch use insulating gate type field effect transistor is cut off and separates the gate of the conversion use insulating gate type field effect transistor and the capacitor connected to this from the  
20 drain when the capacitor holds the voltage level.

69. A display device as set forth in claim 66, wherein:

the receiving part includes a fetch use insulating gate type field effect transistor inserted  
25 between the drain of the conversion use insulating gate

type field effect transistor and the data line and  
the converting part includes a switch use  
insulating gate type field effect transistor inserted  
between the drain and the gate of the conversion use  
5 insulating gate type field effect transistor,.

70. A display device as set forth in claim 69,  
wherein the gate of the fetch use insulating gate type  
field effect transistor and the gate of the switch use  
insulating gate type field effect transistor are  
10 connected to different scanning lines.

71. A display device as set forth in claim 70,  
wherein

the switch use insulating gate type field  
effect transistor becomes conductive when converting the  
15 current level of the signal current to the voltage level  
and electrically connects the drain and the gate of the  
conversion use insulating gate type field effect  
transistor to create the voltage level with the source as  
the reference at the gate,

20 the switch use insulating gate type field  
effect transistor is cut off and separates the gate of  
the conversion use insulating gate type field effect  
transistor and the capacitor connected to this from the  
drain when the capacitor holds the voltage level, and

25 the switch use insulating gate type field

effect transistor becomes unselected and is cut off before the fetch use insulating gate type field effect transistor becomes nonconductive.

72. A display device as set forth in claim 71,  
5 wherein the switch use insulating gate type field effect transistor is made conductive after a predetermined time within one frame period after the switch use insulating gate type field effect transistor and the fetch use insulating gate type field effect transistor become  
10 nonconductive to extinguish in units of scanning lines.

73. A display device as set forth in claim 71,  
wherein a scanning line to which the switch use insulating gate type field effect transistor is connected is provided independently for each of the three primary  
15 colors.

74. A display device as set forth in claim 69,  
wherein a conductivity type of said switch use insulating gate type field effect transistor and a conductivity type of said fetch use insulating gate type transistor are  
20 different.

75. A display device as set forth in claim 67,  
wherein

said drive part includes a drive use insulating gate type field effect transistor provided with a gate, a  
25 drain, a source, and a channel, and

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the drive use insulating gate type field effect transistor receives the voltage level held at the capacitor at its gate and passes a drive current having a current level in accordance with that through the light emitting element via the channel.

76. A display device as set forth in claim 75, wherein the gate of the conversion use insulating gate type field effect transistor and the gate of the drive use insulating gate type field effect transistor are directly connected to configure a current mirror circuit and wherein the current level of the signal current and the current level of the drive current are proportional.

77. A display device as set forth in claim 75, wherein the drive use insulating gate type field effect transistor is formed in the vicinity of the corresponding conversion use insulating gate type field effect transistor inside the pixel and has an equivalent threshold voltage to that of the conversion use insulating gate type field effect transistor.

78. A display device as set forth in claim 77, wherein the size of the conversion use insulating gate type field effect transistor is set larger than the size of the drive use insulating gate type field effect transistor.

79. A display device as set forth in claim 77,

wherein the drive use insulating gate type field effect transistor operates in the saturated region and passes a drive current in accordance with a difference between the level of the voltage applied to the gate thereof and the threshold voltage through the light emitting element.

80. A display device as set forth in claim 77, wherein the drive use insulating gate type field effect transistors operates in the linear region.

81. A display device as set forth in claim 78, wherein the drive use insulating gate type field effect transistors operates in the linear region.

82. A display device as set forth in claim 67, wherein

the drive part shares the conversion use insulating gate type field effect transistor together with the converting part in a time division manner, and

the drive part separates the conversion use insulating gate type field effect transistor from the receiving part and uses the same for driving after the conversion of the signal current is completed and passes the drive current to the light emitting element through the channel in a state where the held voltage level is applied to the gate of the conversion use insulating gate type field effect transistor.

83. A display device as set forth in claim 82,

wherein the drive part comprises a controlling means for cutting off an unnecessary current flowing to the light emitting element via the conversion use insulating gate type field effect transistor at times other than the time of drive.

84. A display device as set forth in claim 83, wherein the controlling means controls the voltage between terminals of two-terminal type light emitting element having a rectification function to cut off the unnecessary current.

85. A display device as set forth in claim 83, wherein

the controlling means comprises a control use insulating gate type field effect transistor inserted between the conversion use insulating gate type field effect transistor and the light emitting element, and

the control use insulating gate type field effect transistor becomes nonconductive in state and separates the conversion use insulating gate type field effect transistor and the light emitting element when the light emitting element is not driven and switches to the conductive state when the light emitting element is driven.

86. A display device as set forth in claim 83, wherein the controlling means controls a ratio between a

time for cutting off the drive current when the light emitting element is not to be driven and placing the light emitting element in the non-light emitting state and a time of passing the drive current when the light emitting element is to be driven and placing the light emitting element in the light emitting and thereby to enable the control of the brightness of the pixel.

87. A display device as set forth in claim 82, wherein the drive part comprises a potential fixing means for fixing the potential of the drain with reference to the source of the conversion use insulating gate type field effect transistor in order to stabilize the current level of the drive current flowing to the light emitting element through the conversion use insulating gate type field effect transistor.

88. A display device as set forth in claim 66, wherein the receiving part, the converting part, and the drive part configure a current circuit combining a plurality of insulating gate type field effect transistors, and

one or two or more insulating gate type field effect transistors have a double gate structure for suppressing current leakage in the current circuit.

89. A display device as set forth in claim 66,



wherein

the drive part includes an insulating gate type field effect transistor provided with a gate, drain, and a source and passes the drive current passing between the drain and the source to the light emitting element in accordance with the level of the voltage applied to the gate, and

the light emitting element is a two terminal type having an anode and a cathode, where the cathode is connected to the drain.

90. A display device as set forth in claim 66, wherein

the drive part includes an insulating gate type field effect transistor provided with a gate, a drain, and a source and passes a drive current passing between the drain and the source to the light emitting element in accordance with the level of the voltage applied to the gate, and

the light emitting element is a two terminal type having an anode and a cathode, where the anode is connected to the source.

91. A display device as set forth in claim 66, further including an adjusting means for downwardly adjusting the voltage level held by the converting part and supplying the same to the drive part to tighten the

black level of the brightness of each pixel.

92. A display device as set forth in claim 66,  
wherein a leak element is connected between said data  
line and a predetermined potential.

5 93. A display device as set forth in claim 66,  
wherein an initial value setting element for setting said  
data to an initial value before said scanning line is  
selected is connected between said data line and a  
predetermined potential.

10 94. A display device as set forth in claim 93,  
wherein  
the drive part includes an insulating gate type  
field effect transistor having a gate, a drain, and a  
source, and

15 the adjusting means downwardly adjusts the  
level of the voltage applied to the gate by raising the  
bottom of the voltage between the gate and the source of  
the insulating gate type field effect transistor.

20 95. A display device as set forth in claim 93,  
wherein  
the drive part includes an insulating gate type  
field effect transistor having a gate, a drain, and a  
source,

25 the converting part is provided with a  
capacitor connected to the gate of the thin film

transistor and holding the voltage level, and

the adjusting means comprises an additional capacitor connected to that capacitor and downwardly adjusts the level of the voltage to be applied to the gate of the insulating gate type field effect transistor held at that capacitor.

96. A display device as set forth in claim 93, wherein

the drive part includes an insulating gate type field effect transistor having a gate, a drain, and a source,

the converting part is provided with a capacitor connected to the gate of the insulating gate type field effect transistor on its one end and holding the voltage level, and

the adjusting means adjusts the potential of the other end of the capacitor when holding the voltage level converted by the converting part at that capacitor to downwardly adjust the level of the voltage to be applied to the gate of the insulating gate type field effect transistor.

97. A display device as set forth in claim 66, wherein the light emitting element comprises an organic electroluminescence element.

98. A display device as set forth in claim 75,

wherein the drive use insulating gate type field effect transistor comprises a P-channel type.

99. A display device comprising
- a scanning line drive circuit for successively selecting scanning lines,
  - a data line drive circuit including a current source for generating a signal current having a current level in accordance with brightness information and successively supplying the same to data lines, and
  - a plurality of pixels arranged at intersecting portions of the scanning lines and the data lines and including current driven type light emitting elements emitting light by receiving the supply of the drive current, wherein
    - each pixel comprises
      - a conversion use insulating gate type field effect transistor having a source connected to a reference potential,
      - a fetch use insulating gate type field effect transistor inserted between the drain of the conversion use insulating gate type field effect transistor and the data line and having a gate connected to a scanning line,
      - a drive use insulating gate type field effect transistor connected between a reference potential

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and a light emitting element,

a capacitor having a first electrode  
connected in common to a gate of the conversion use  
insulating gate type field effect transistor and a gate  
5 of the drive use insulating gate type field effect  
transistor and having a second electrode connected to a  
reference potential, and

a switch use insulating gate type field  
effect transistor connected between a gate and drain of  
10 said conversion use insulating gate type field effect  
transistor and having a gate connected to a scanning  
line.

100. A display device comprising

a scanning line drive circuit for successively  
15 selecting scanning lines,

a data line drive circuit including a current  
source for generating a signal current having a current  
level in accordance with brightness information and  
successively supplying the same to data lines, and

20 a plurality of pixels arranged at intersecting  
portions of the scanning lines and the data lines and  
including current driven type light emitting elements  
emitting light by receiving the supply of the drive  
current, wherein

25 each pixel comprises

a conversion use insulating gate type field effect transistor having a source connected to a reference potential,

5 a fetch use insulating gate type field effect transistor connected between the drain of the conversion use insulating gate type field effect transistor and the data line and having a gate connected to a scanning line,

10 a drive use insulating gate type field effect transistor connected between a reference potential and a light emitting element,

15 a capacitor having a first electrode connected to a gate of the drive use insulating gate type field effect transistor and having a second electrode connected to a reference potential, and

20 a switch use insulating gate type field effect transistor connected between a gate of said conversion use insulating gate type field effect transistor and a connecting point between a gate of said drive use insulating gate type field effect transistor and a first electrode of said capacitor and having a gate connected to a scanning line.

101. A display device as set forth in claim 100, wherein the control terminal of the fetch use insulating gate type field effect transistor and the control

25

terminal of the switch use insulating gate type field effect transistor are connected to different scanning lines.

102. A display device as set forth in claim 100,  
5 wherein the size of the conversion use insulating gate type field effect transistor is set larger than the size of the drive use insulating gate type field effect transistor.

103. A display device as set forth in claim 101,  
10 wherein the switch use insulating gate type field effect transistor is made conductive after a predetermined time within one frame period after the switch use insulating gate type field effect transistor and the fetch use insulating gate type field effect transistor become  
15 nonconductive to extinguish in units of scanning lines.

104. A pixel circuit for driving a current-driven type light emitting element arranged at an intersecting portion of a data line supplying a signal current of a current level in accordance with brightness information  
20 and a scanning line supplying a selection pulse and emitting light by the drive current, comprising

a receiving part for fetching the signal current from said data line in response to a selection pulse from said scanning line,

25 a converting part for converting a current

~~a drive part for passing a drive current having a current level in accordance with the held voltage level through the light emitting element.~~

105. A pixel circuit as set forth in claim 104,  
wherein the converting part includes a conversion use  
insulating gate type field effect transistor provided  
with a gate, a source, a drain, and a channel and a  
capacitor connected to the gate.

the converting part includes a switch use  
insulating gate type field effect transistor inserted  
15 between the drain and the gate of the conversion use  
insulating gate type field effect transistor,

the switch use insulating gate type field effect transistor becomes conductive when converting the current level of the signal current to the voltage level and electrically connects the drain and the gate of the conversion use insulating gate type field effect transistor to create the voltage level with the source as the reference at the gate, and

the switch use insulating gate type field  
25 effect transistor is cut off and separates the gate of



107. A pixel circuit as set forth in claim 104,  
5 wherein:  
the receiving part includes a fetch use  
insulating gate type field effect transistor inserted  
between the drain of the conversion use insulating gate  
type field effect transistor and the data line and  
10 the converting part includes a switch use  
insulating gate type field effect transistor inserted  
between the drain and the gate of the conversion use  
insulating gate type field effect transistor, .

108. A pixel circuit as set forth in claim 107,  
15 wherein the gate of the fetch use insulating gate type  
field effect transistor and the gate of the switch use  
insulating gate type field effect transistor are  
connected to different scanning lines.

109. A pixel circuit as set forth in claim 108,  
20 wherein  
the switch use insulating gate type field  
effect transistor becomes conductive when converting the  
current level of the signal current to the voltage level  
and electrically connects the drain and the gate of the  
25 conversion use insulating gate type field effect

transistor to create the voltage level with the source as the reference at the gate,

the switch use insulating gate type field effect transistor is cut off and separates the gate of the conversion use insulating gate type field effect transistor and the capacitor connected to this from the drain when the capacitor holds the voltage level, and

the switch use insulating gate type field effect transistor becomes unselected and is cut off before the fetch use insulating gate type field effect transistor becomes nonconductive.

110. A pixel circuit as set forth in claim 109, wherein the switch use insulating gate type field effect transistor is made conductive after a predetermined time within one frame period after the switch use insulating gate type field effect transistor and the fetch use insulating gate type field effect transistor become nonconductive to extinguish in units of scanning lines.

111. A pixel circuit as set forth in claim 105, wherein a scanning line to which the switch use insulating gate type field effect transistor is connected is provided independently for each of the three primary colors.

112. A pixel circuit as set forth in claim 107, wherein a conductivity type of said switch use insulating

110. A pixel circuit as set forth in claim 109,

gate type field effect transistor and a conductivity type of said fetch use insulating gate type transistor are different.

113. A pixel circuit as set forth in claim 105,  
5 wherein  
said drive part includes a drive use insulating gate type field effect transistor provided with a gate, a drain, a source, and a channel, and

10 the drive use insulating gate type field effect transistor receives the voltage level held at the capacitor at its gate and passes a drive current having a current level in accordance with that through the light emitting element via the channel.

114. A pixel circuit as set forth in claim 113,  
15 wherein the gate of the conversion use insulating gate type field effect transistor and the gate of the drive use insulating gate type field effect transistor are directly connected to configure a current mirror circuit and wherein the current level of the signal current and  
20 the current level of the drive current are proportional.

115. A pixel circuit as set forth in claim 113,  
wherein the drive use insulating gate type field effect transistor is formed in the vicinity of the corresponding conversion use insulating gate type field effect  
25 transistor inside the pixel and has an equivalent

threshold voltage to that of the conversion use  
insulating gate type field effect transistor.

116. A pixel circuit as set forth in claim 115,  
wherein the size of the conversion use insulating gate  
5 type field effect transistor is set larger than the size  
of the drive use insulating gate type field effect  
transistor.

117. A pixel circuit as set forth in claim 115,  
wherein the drive use insulating gate type field effect  
10 transistor operates in the saturated region and passes a  
drive current in accordance with a difference between the  
level of the voltage applied to the gate thereof and the  
threshold voltage through the light emitting element.

118. A pixel circuit as set forth in claim 115,  
15 wherein the drive use insulating gate type field effect  
transistors operates in the linear region.

119. A pixel circuit as set forth in claim 116,  
wherein the drive use insulating gate type field effect  
transistors operates in the linear region.

20 120. A pixel circuit as set forth in claim 121,  
wherein

the drive part shares the conversion use  
insulating gate type field effect transistor together  
with the converting part in a time division manner, and

25 the drive part separates the conversion use

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insulating gate type field effect transistor from the receiving part and uses the same for driving after the conversion of the signal current is completed and passes the drive current to the light emitting element through the channel in a state where the held voltage level is applied to the gate of the conversion use insulating gate type field effect transistor.

121. A pixel circuit as set forth in claim 120, wherein the drive part comprises a controlling means for cutting off an unnecessary current flowing to the light emitting element via the conversion use insulating gate type field effect transistor at times other than the time of drive.

122. A pixel circuit as set forth in claim 121, wherein the controlling means controls the voltage between terminals of two-terminal type light emitting element having a rectification function to cut off the unnecessary current.

123. A pixel circuit as set forth in claim 121, wherein

the controlling means comprises a control use insulating gate type field effect transistor inserted between the conversion use insulating gate type field effect transistor and the light emitting element, and the control use insulating gate type field

effect transistor becomes nonconductive in state and separates the conversion use insulating gate type field effect transistor and the light emitting element when the light emitting element is not driven and switches to the conductive state when the light emitting element is driven.

124. A pixel circuit as set forth in claim 121, wherein the controlling means controls a ratio between a time for cutting off the drive current when the light emitting element is not to be driven and placing the light emitting element in the non-light emitting state and a time of passing the drive current when the light emitting element is to be driven and placing the light emitting element in the light emitting and thereby to enable the control of the brightness of the pixel.

125. A pixel circuit as set forth in claim 120, wherein the drive part comprises a potential fixing means for fixing the potential of the drain with reference to the source of the conversion use insulating gate type field effect transistor in order to stabilize the current level of the drive current flowing to the light emitting element through the conversion use insulating gate type field effect transistor.

126. A pixel circuit as set forth in claim 104, wherein

the receiving part, the converting part, and the drive part configure a current circuit combining a plurality of insulating gate type field effect transistors, and

5 one or two or more insulating gate type field effect transistors have a double gate structure for suppressing current leakage in the current circuit.

127. A pixel circuit as set forth in claim 104, wherein

10 the drive part includes an insulating gate type field effect transistor provided with a gate, drain, and a source and passes the drive current passing between the drain and the source to the light emitting element in accordance with the level of the voltage applied to the  
15 gate, and

the light emitting element is a two terminal type having an anode and a cathode, where the cathode is connected to the drain.

128. A pixel circuit as set forth in claim 104,  
20 wherein

the drive part includes an insulating gate type field effect transistor provided with a gate, a drain, and a source and passes a drive current passing between the drain and the source to the light emitting element in  
25 accordance with the level of the voltage applied to the

gate, and

the light emitting element is a two terminal type having an anode and a cathode, where the anode is connected to the source.

5 129. A pixel circuit as set forth in claim 104, further including an adjusting means for downwardly adjusting the voltage level held by the converting part and supplying the same to the drive part to tighten the black level of the brightness of each pixel.

10 130. A pixel circuit as set forth in claim 104, wherein a leak element is connected between said data line and a predetermined potential.

15 131. A pixel circuit as set forth in claim 104, wherein an initial value setting element for setting said data to an initial value connected between said data line and a predetermined potential.

132. A pixel circuit as set forth in claim 129, wherein

20 the drive part includes an insulating gate type field effect transistor having a gate, a drain, and a source, and

the adjusting means downwardly adjusts the level of the voltage applied to the gate by raising the bottom of the voltage between the gate and the source of  
25 the insulating gate type field effect transistor.



the adjusting means adjusts the potential of  
the other end of the capacitor when holding the voltage  
25 level converted by the converting part at that capacitor

to downwardly adjust the level of the voltage to be applied to the gate of the insulating gate type field effect transistor.

135. A pixel circuit as set forth in claim 104,  
5 wherein the light emitting element comprises an organic electroluminescence element.

136. A pixel circuit as set forth in claim 113,  
wherein the drive use insulating gate type field effect transistor comprises a P-channel type.

10 137. A pixel circuit for driving a current-driven type light emitting element arranged at an intersecting portion of a data line supplying a signal current of a current level in accordance with brightness information and a scanning line supplying a selection pulse and

15 emitting light by the drive current, comprising

a conversion use insulating gate type field effect transistor having a source connected to a reference potential,

20 a fetch use insulating gate type field effect transistor inserted between the drain of the conversion use insulating gate type field effect transistor and the data line and having a gate connected to a scanning line,

25 a drive use insulating gate type field effect transistor connected between a reference potential and a light emitting element,

a capacitor having a first electrode connected in common to a gate of the conversion use insulating gate type field effect transistor and a gate of the drive use insulating gate type field effect transistor and having a  
5 second electrode connected to a reference potential, and

a switch use insulating gate type field effect transistor connected between a gate and drain of said conversion use insulating gate type field effect transistor and having a gate connected to a scanning  
10 line.

138. A pixel circuit for driving a current-driven type light emitting element arranged at an intersecting portion of a data line supplying a signal current of a current level in accordance with brightness information  
15 and a scanning line supplying a selection pulse and emitting light by the drive current, comprising

a conversion use insulating gate type field effect transistor having a source connected to a reference potential,

20 a fetch use insulating gate type field effect transistor connected between the drain of the conversion use insulating gate type field effect transistor and the data line and having a gate connected to a scanning line,

a drive use insulating gate type field effect transistor connected between a reference potential and a  
25

light emitting element,

a capacitor having a first electrode connected to a gate of the drive use insulating gate type field effect transistor and having a second electrode connected to a reference potential, and

a switch use insulating gate type field effect transistor connected between a gate of said conversion use insulating gate type field effect transistor and a connecting point between a gate of said drive use insulating gate type field effect transistor and a first electrode of said capacitor and having a gate connected to a scanning line.

139. A pixel circuit as set forth in claim 138, wherein the control terminal of the fetch use insulating gate type field effect transistor and the control terminal of the switch use insulating gate type field effect transistor are connected to different scanning lines.

140. A pixel circuit as set forth in claim 138, wherein the size of the conversion use insulating gate type field effect transistor is set larger than the size of the drive use insulating gate type field effect transistor.

141. A pixel circuit as set forth in claim 139, wherein the switch use insulating gate type field effect

transistor is made conductive after a predetermined time within one frame period after the switch use insulating gate type field effect transistor and the fetch use insulating gate type field effect transistor become  
5 nonconductive to extinguish in units of scanning lines.

142. A method of driving a light emitting element for driving a current-driven type light emitting element arranged at an intersecting portion of a data line supplying a signal current of a current level in  
10 accordance with brightness information and a scanning line supplying a selection pulse and emitting light by the drive current, comprising

a receiving routine for fetching the signal current from said data line in response to a selection  
15 pulse from said scanning line,

a converting routine for converting a current level of the fetched signal current to a voltage level and holding the same, and

a drive routine for passing a drive current  
20 having a current level in accordance with the held voltage level through the light emitting element.

143. A method of driving a light emitting element as set forth in claim 142, wherein

the converting routine includes a routine using  
25 a conversion use insulating gate type field effect

2025 RELEASE UNDER E.O. 14176

145. A method of driving a light emitting element as set forth in claim 143, wherein:

in the routine, the drive use insulating gate type field effect transistor receives the voltage level held at the capacitor at its gate and passes a drive current having a current level in accordance with that through the light emitting element via the channel.

147. A method of driving a light emitting element as set forth in claim 145, wherein the drive use insulating gate type field effect transistor is formed in the vicinity of the corresponding conversion use insulating gate type field effect transistor inside the

transistor provided with a gate, a source, a drain, and a channel and a capacitor connected to the gate,

in the routine, the conversion use insulating gate type field effect transistor creates the voltage level converted by passing the fetched signal current though the channel in the receiving routine at the gate, and the capacitor holds voltage level created at the gate.

144. A method of driving a light emitting element as set forth in claim 143, wherein

the converting routine includes a routine using a switch use insulating gate type field effect transistor inserted between the drain and the gate of the conversion use insulating gate type field effect transistor,

in the routine, the switch use insulating gate type field effect transistor becomes conductive when converting the current level of the signal current to the voltage level and electrically connects the drain and the gate of the conversion use insulating gate type field effect transistor to create the voltage level with the source as the reference at the gate, and

the switch use insulating gate type field effect transistor is cut off and separates the gate of the conversion use insulating gate type field effect transistor and the capacitor connected to this from the

pixel and has an equivalent threshold voltage to that of the conversion use insulating gate type field effect transistor.

148. A method of driving a light emitting element as  
5 set forth in claim 147, wherein the drive use insulating gate type field effect transistor operates in the saturated region and passes a drive current in accordance with a difference between the level of the voltage applied to the gate thereof and the threshold voltage  
10 through the light emitting element.

149. A method of driving a light emitting element as set forth in claim 143, wherein

the drive routine part shares the conversion use insulating gate type field effect transistor together  
15 with the converting part in a time division manner, and

the drive routine separates the conversion use insulating gate type field effect transistor from the receiving part and uses the same for driving after the conversion of the signal current is completed and passes  
20 the drive current to the light emitting element through the channel in a state where the held voltage level is applied to the gate of the conversion use insulating gate type field effect transistor.

150. A method of driving a light emitting element as  
25 set forth in claim 149, wherein the drive routine



includes a control routine for cutting off an unnecessary current flowing to the light emitting element via the conversion use insulating gate type field effect transistor at times other than the time of drive.

5        151. A method of driving a light emitting element as set forth in claim 150, wherein the control routine controls the voltage between terminals of two-terminal type light emitting element having a rectification function to cut off the unnecessary current.

10        152. A method of driving a light emitting element as set forth in claim 150, wherein

the control routines comprises a routine using a control use insulating gate type field effect transistor inserted between the conversion use insulating gate type field effect transistor and the light emitting element, and

15

in the routine, the control use insulating gate type field effect transistor becomes nonconductive in state and separates the conversion use insulating gate type field effect transistor and the light emitting element when the light emitting element is not driven and switches to the conductive state when the light emitting element is driven.

20

153. A method of driving a light emitting element as set forth in claim 150, wherein the control routine

25

controls a ratio between a time for cutting off the drive  
current when the light emitting element is not to be  
driven and placing the light emitting element in the non-  
light emitting state and a time of passing the drive  
5 current when the light emitting element is to be driven  
and placing the light emitting element in the light  
emitting and thereby to enable the control of the  
brightness of the pixel.

154. A method of driving a light emitting element as  
10 set forth in claim 150, wherein the drive routine  
includes a potential fixing routine for fixing the  
potential of the drain with reference to the source of  
the conversion use insulating gate type field effect  
transistor in order to stabilize the current level of the  
15 drive current flowing to the light emitting element  
through the conversion use insulating gate type field  
effect transistor.

155. A method of driving a light emitting element as  
set forth in claim 143, wherein  
20 the receiving routine, the converting routine,  
and the drive routine are executed on a current circuit  
combining a plurality of insulating gate type field  
effect transistors, and

one or two or more insulating gate type field  
25 effect transistors have a double gate structure for

suppressing current leakage in the current circuit.

156. A method of driving a light emitting element as set forth in claim 142, wherein

the drive routine is performed using an  
5 insulating gate type field effect transistor provided with a gate, drain, and a source and passes the drive current passing between the drain and the source to the light emitting element in accordance with the level of the voltage applied to the gate, and

10 the light emitting element is a two terminal type having an anode and a cathode, where the cathode is connected to the drain.

157. A method of driving a light emitting element as set forth in claim 142, wherein

15 the drive routine is performed using an insulating gate type field effect transistor provided with a gate, a drain, and a source and passes a drive current passing between the drain and the source to the light emitting element in accordance with the level of  
20 the voltage applied to the gate, and

the light emitting element is a two terminal type having an anode and a cathode, where the anode is connected to the source.

158. A method of driving a light emitting element as  
25 set forth in claim 142, further including an adjusting

5        159. A method of driving a light emitting element as  
set forth in claim 158, wherein

10           the adjusting routine downwardly adjusts the  
level of the voltage applied to the gate by raising the  
bottom of the voltage between the gate and the source of  
the insulating gate type field effect transistor.

160. A method of driving a light emitting element as  
15 set forth in claim 158, wherein

the converting routine uses a capacitor  
20 connected to the gate of the thin film transistor and  
holding the voltage level, and

the adjusting routine uses an additional capacitor connected to that capacitor and downwardly adjusts the level of the voltage to be applied to the gate of the insulating gate type field effect transistor

held at that capacitor.

161. A method of driving a light emitting element as set forth in claim 158, wherein

the drive routine uses an insulating gate type field effect transistor having a gate, a drain, and a source,

the converting routine uses a capacitor connected to the gate of the insulating gate type field effect transistor on its one end and holding the voltage level, and

the adjusting means routine adjusts the potential of the other end of the capacitor when holding the voltage level converted by the converting routine at that capacitor to downwardly adjust the level of the voltage to be applied to the gate of the insulating gate type field effect transistor.

162. A method of driving a light emitting element as set forth in claim 142, wherein the light emitting element comprises an organic electroluminescence element.

163. A display device including:

scanning lines for selecting pixels and data lines giving brightness information for driving the pixels arranged in a matrix,

each pixel including a light emitting element changing in brightness by an amount of current supplied,

5 a writing means controlled by a scanning line and writing  
in the pixel brightness information given from the data  
line, and a drive means for controlling the amount of  
current supplied to said light emitting element in  
accordance with the written brightness information,

10 the brightness information being written in  
each pixel by applying an electric signal in accordance  
with the brightness information to the data line in the  
state with the scanning line selected,  
the brightness information written in each  
pixel being held in each pixel even after the scanning  
line is not selected and the light emitting element of  
each pixel able to remain lighted by a brightness in  
accordance with the held brightness information, further  
15 comprising

an adjusting means for downwardly adjusting the  
brightness information written by said writing means and  
supplying the same to said drive means to tighten the  
blackness level of each pixel.

20 164. A pixel circuit for driving a pixel having a  
light emitting element arranged at an intersecting  
portion of a data line supplying brightness information  
and a scanning line supplying a selection pulse and  
emitting light in accordance with said brightness  
25 information, including

a writing means controlled by a scanning line and writing in the pixel brightness information given from the data line and a drive means for controlling the amount of current supplied to said light emitting element  
5 in accordance with the written brightness information,

the brightness information being written in each pixel by applying an electric signal in accordance with the brightness information to the data line in the state with the scanning line selected,  
10

the brightness information written in each pixel being held in each pixel even after the scanning line is not selected and the light emitting element of each pixel able to remain lighted by a brightness in accordance with the held brightness information, further  
15 comprising

an adjusting means for downwardly adjusting the brightness information written by said writing means and supplying the same to said drive means to tighten the blackness level of each pixel.

20 165. A method of driving a display device including scanning lines for selecting pixels and data lines giving brightness information for driving the pixels arranged in a matrix, each pixel including a light emitting element changing in brightness by an amount of current supplied,  
25 comprising:

a writing routine controlled by a scanning line  
and writing in the pixel brightness information given  
from the data line and a drive routine for controlling  
the amount of current supplied to said light emitting  
5 element in accordance with the written brightness  
information,

the brightness information being written in  
each pixel by applying an electric signal in accordance  
with the brightness information to the data line in the  
10 state with the scanning line selected,

the brightness information written in each  
pixel being held in each pixel even after the scanning  
line is not selected and the light emitting element of  
each pixel able to remain lighted by a brightness in  
15 accordance with the held brightness information, further  
comprising

an adjusting routine for downwardly adjusting  
the brightness information written by said writing  
routine and supplying the same to said drive routine to  
20 tighten the blackness level of each pixel.